From Katrina to Sandy and Beyond: NOAA tracks hurricanes from space

Hurricane Katrina: 10 Years Later

NOAA.gov

Ten years ago, NOAA satellites tracked what would be the most destructive hurricane to strike the United States. Hurricane Katrina broke records for its costly and far-reaching devastation, and the satellite data that helped forecast that monster storm are the backbone for all of NOAA's accurate weather and climate prediction.

Satellite data have contributed to NOAA's improved weather forecasts: Today's three-day forecasts are as accurate as two-day forecasts were 10 years ago.

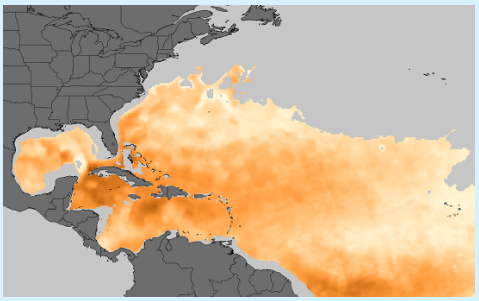
NOAA operates two types of satellites—**geostationary** and **polar-orbiting**—that provide real-time data and imagery 24/7 that track all climate and weather, including hurricanes.

Geostationary Operational Environmental Satellites (GOES) provide continuous imagery and measurements of air, land, water and ice across the Western Hemisphere from a fixed position in orbit, more than 22,300 miles above Earth. This allows meteorologists to constantly monitor conditions for severe weather.

Polar-orbiting Operational Environmental Satellites (POES) fly 540 miles above Earth, and because Earth rotates while these satellites travel from the North Pole to the South Pole, they collect land, ocean and atmospheric data from the entire globe. These satellites are the main sources of observational data used to build weather prediction models that are essential for accurate weather forecasts.

Katrina shows the value of altimetry data

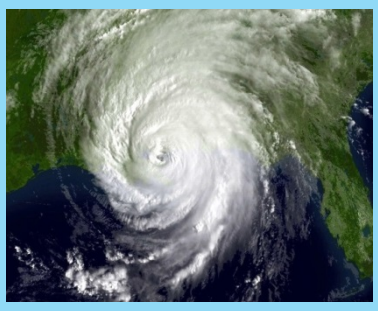
Hurricane Katrina intensified to a Category 5 storm after crossing regions of high ocean heat content in the Gulf of Mexico. **Scientists were able to track this intensification using data from satellite-born altimeters**, which directly measure sea surface height and from which ocean heat content can be derived.



Ocean heat content data. Credit: NOAA

Today, with the help of international partners, we are set to have six satellites collecting altimeter data within the next two years

SATELLITE USAGE: From Katrina to Sandy



GOES-12 image of Hurricane Katrina shortly after landfall on August 29, 2005. Credit: NOAA

In 2005, NOAA's GOES and POES kept close tabs on Hurricane Katrina. NOAA's GOES satellites provided **one image every five minutes during Hurricane Katrina** from August 26-30, 2005. This proved invaluable to NOAA hurricane forecasters on the ground tracking the storm.

By Hurricane Sandy in 2012, NOAA had launched a fleet of GOES satellites with faster, higher resolution instruments and the next-generation polar-orbiting satellite, Suomi NPP, with nighttime imaging capabilities and higher resolution atmospheric data.

NOAA GOES-R satellite, set to launch in 2016, will be able to catch **one image every 30 seconds** during a major storm event and will features significantly improved data collection capabilities.

In the Belly of the Hurricane: Real-time Transmission of Aircraft Data

Coyote UAS aboard NOAA WP-3D Orion. Credit: NOAA

During Hurricane Katrina, NOAA P-3 hurricane-hunter aircraft collected radar packet data via a satellite phone data link. By 2008, Doppler radar data became available in real-time. Now, GOES data are routinely available to pilots flying around—and through—storms.

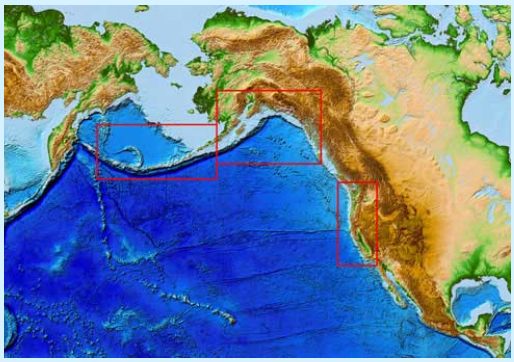
Today, scientists have a new tool to collect data in places that NOAA's P-3 aircraft can't safely go.

The Coyote unmanned aircraft system flies in the lower part of a hurricane, where it is too dangerous for the P-3. It measures air pressure, temperature, moisture, sea-surface temperatures and wind speed inside the storm. These observations should help reveal how a hurricane pulls energy from the ocean—and improve predictions of intensity.

The Future of Satellite Observations: Better, Faster Data

Today, **NOAA is developing a gold-standard method for rapidly creating high-resolution digital models that show the topography**—hills, valleys and other physical features—of the ocean bottom. These models will not only improve the United States' ability to prepare for storms, but will also aid in recovery in their wake.

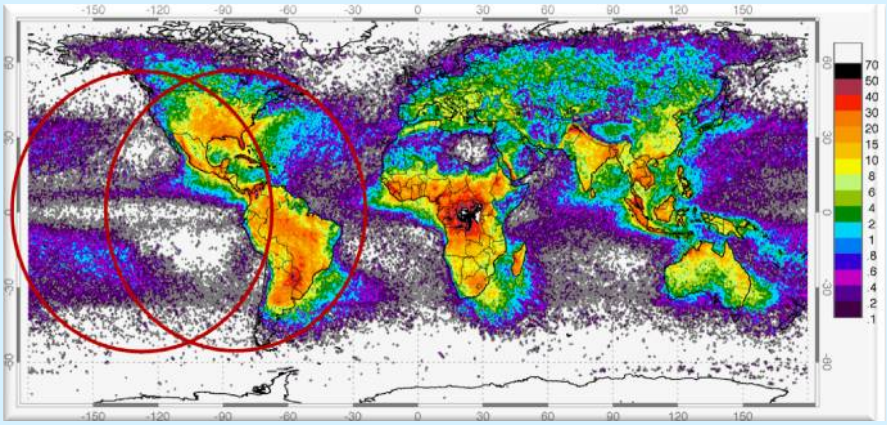
The physical features of the ocean bottom affect the way water runs on shore. New models will help forecasters improve their flood forecasting. Storms can also change bottom topography, shifting sand and creating new channels. The shipping industry and other offshore operators can use these models to safely and quickly avoid underwater hazards



Digital elevation model from the National Centers for Environmental Information. Credit: NOAA

Coastal Mapping

NOAA is working to launch the next-generation geostationary satellite fleet (GOES-R) and the Joint Polar Satellite System (JPSS)—both will work in tandem to improve hurricane forecasts. GOES-R will show nearly continuous images of hurricanes with a quality never seen before, and provide longer watch and warning lead times for areas under hurricane threat.



Lightning flash data will improve with GOES-R capabilities. Credit: NOAA

The satellites will improve hurricane path forecasts and better depict ocean currents, low-level winds and calm areas.

GOES-R also will feature the Geostationary Lightning Mapper, which will provide near total lightning coverage over both land and ocean and enable new hurricane research on how lightning relates to hurricane intensification.